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EXAMINER	
KIBLER, VIRGINIA M	
ART UNIT	**PAPER NUMBER**
2623	8

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/451,084	AKOPYAN ET AL.	
	Examiner	Art Unit	
	Virginia M Kibler	2623	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 September 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-36* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-36* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Response to Amendment

1. The pre-amendment received on 9/8/03 has been entered. Claims 1-36 remain pending.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-4, 14, 17, 21, 24, 25, 27, and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nichani et al. (5,673,334) in view of Ueda et al. (5,271,068).

Regarding claims 1 and 27, Nichani et al. ("Nichani") discloses a method for training a system to inspect a spatially distorted pattern (Col. 3, lines 65-67). The method comprises receiving a digitized image of an object 54 (Figure 4). The image includes a region of interest which is divided into a plurality of windows, thereby "sub-regions" (Col. 7, 40-43). Note, Nichani discloses the windows should be big enough to accommodate the uncertain orientation of the package at run time (Col. 7, 43-46). However, a conventional inspecting method is used to reliably inspect each window or "sub-region" (Col. 12, lines 14-17), thereby the size of each sub-regions is small enough such that a conventional inspecting method can reliably inspect each of the sub-regions. Nichani also discloses training a search tool and an inspection tool for a respective model for each of the plurality of sub-regions (Col. 6, lines 26-30), building a search tree for determining an order for inspecting the plurality of sub-regions (Col. 9, lines 17-21), and

training a coarse alignment tool 56 (Figure 4) for the region of interest (Col. 5, lines 55-58). Nichani discloses constructing a minimum spanning forest constituted by a plurality of trees (Col. 9, lines 53-63). While Nichani does not expressly state building a single search tree, Nichani discloses the number of trees can be manually input (Col. 9, lines 64-67, Col. 10, lines 1-4). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified the number of search trees disclosed by Nichani to include specifying a single search tree because it is well known in the art and would be a matter of design choice depending on the number of local alignment points (Col. 9, lines 64-67, Col. 10, lines 1-4). Nichani does not recognize dividing the region of interest in its entirety. However, Ueda et al. ("Ueda") teaches that it is known to divide the region of interest in its entirety into a plurality of sub-regions (Figure 3a; Col. 8, lines 4-25). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified the dividing the region of interest disclosed by Nichani to include dividing the region of interest in its entirety, as taught by Ueda, because it is a methodology routinely implemented in the art for inspection using template matching.

Regarding claim 14, Nichani discloses a method and apparatus for inspecting a spatially distorted pattern (Abstract, lines 1-2). The arguments analogous to those presented above for claim 1 are applicable to claim 14. Nichani discloses a memory for storing a digitized image of an object (Col. 5, lines 39-43), a region divider for dividing the digitized image of a region of interest into a plurality of sub-regions (Col. 7, 40-43), a coarse alignment 56, a search mechanism (Col. 3, lines 65-67) for locating each of the sub-regions sequentially in an ordered

based on search tree information (Col. 4, lines 1-4), and an inspector for inspecting the sub-regions (Col. 4, lines 28-29).

Regarding claim 21, the arguments analogous to those presented above for claims 1 and 14 are applicable to claim 21.

Regarding claims 2, 17, and 24, the arguments analogous to those presented above for claim 1 are applicable to claims 2, 17, and 24. Nichani discloses the size of the sub-regions being small enough such that a conventional inspecting method can reliably inspect each of the sub-regions. While Nichani does not recognize being able to approximate each of the sub-regions by an affine transformation, it would have been an obvious matter of design choice to specify the approximating the sub-regions by an affine transformation. Affine transformation is well known and routinely implemented in the art for correcting geometric distortions in an image, as well as for adding visual effects.

Regarding claims 3, 25, and 28, Nichani discloses establishing the order so that transformation information for located ones of the sub-regions is used to minimize a search range for neighboring ones of the sub-regions (Col. 9, lines 13-40).

Regarding claim 4, Nichani does not appear to recognize using a correlation search. However, Ueda detaches that it is known to train a search tool for respective models for each of the plurality of sub-regions using a degree of resemblance, or correlation search (Col. 14, lines 5-45). Ueda discloses templates corresponding to each sub-region, rather than a single model. However, it would have been an obvious matter of design choice to have modified the templates corresponding to each sub-region disclosed by Ueda to include a single model for each template because it would minimize the time required to search each sub-region. Therefore, it would have

been obvious to one of ordinary skill in the art at the time of the invention to have modified the training disclosed by Nichani to include using a correlation search as taught by Ueda because it is a methodology routinely implemented in the art to match a template and an image.

4. Claims 6, 8, 10, 16, 23, 29, and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nichani et al. (5,673,334) in view of Ueda et al. (5,271,068) in further view of Companion et al. (6,330,354).

Regarding claim 6, Nichani discloses a method for inspecting a spatially distorted pattern (Col. 3, lines 65-67). The method comprises running a coarse alignment tool to approximately locate the pattern (Col. 11, lines 9-11), using search tree information (Col. 9, lines 17-21) and an approximate location of a root sub-region found by the coarse alignment tool (Col. 11, lines 6-11) to locate a plurality of sub-regions sequentially in an order according to the search tree information (Col. 5, lines 46-49). Note, Nichani discloses the windows should be big enough to accommodate the uncertain orientation of the package at run time (Col. 7, 43-46). However, a conventional inspecting method is used to reliably inspect each window or "sub-region" (Col. 12, lines 14-17) using respective models (Col. 6, lines 26-30), thereby the size of each sub-regions is small enough such that a conventional inspecting method can reliably inspect each of the sub-regions using respective models. The arguments analogous to those presented above for claim 1 are applicable to claim 6. Ueda discloses producing a degree of resemblance for each of the sub-regions (Col. 8, lines 16-25), but does not disclose producing a difference image. However, Companion et al. ("Companion") teaches that it is known to produce a difference image (Abstract). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified the template matching disclosed by Nichani and Ueda to

include producing a difference image, as taught by Companion, because it is a methodology routinely implemented in the art in order emphasize the sub-region's deviation from the template to facilitate the inspection.

Regarding claim 29, the arguments analogous to those presented above for claims 6 and 27 are applicable to claim 29.

Regarding claims 8, 16, 23, and 30, Nichani discloses inspecting each of the sub-regions (Col. 13, lines 53-54). Nichani does not appear to specify producing both a difference image and a match image. However, Ueda discloses producing a correlation for each sub-region (Col. 8, lines 16-39). Companion teaches that it is known to produce a difference image for each of the sub-regions (Col. 5, lines 1-7). Companion also teaches that it is known to combine the difference images into a single difference image (Col. 6, lines 10-12). Therefore, it would have been obvious to one of ordinary skill in the art to have modified the inspection as disclosed by Nichani to include producing and combining difference images, as taught by Companion, as well as match images, as taught by Ueda, because it is well known in the art of template matching in order to further inspect each sub-region.

Regarding claim 10, the arguments analogous to those presented above for claim 2 are applicable to claim 10.

5. Claims 34-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nichani et al. (5,673,334) in view He et al. (6,088,482).

Regarding claims 34-36, Nichani discloses running a coarse alignment tool to approximately locate the pattern (Col. 11, lines 9-11), using search tree information (Col. 9, lines 17-21) and an approximate location of a root sub-region found by the coarse alignment tool (Col.

11, lines 6-11) to locate a plurality of sub-regions sequentially in an order according to the search tree information (Col. 5, lines 46-49). Note, Nichani discloses the windows should be big enough to accommodate the uncertain orientation of the package at run time (Col. 7, 43-46). However, a conventional inspecting method is used to reliably inspect each window or "sub-region" (Col. 12, lines 14-17) using respective models (Col. 6, lines 26-30), thereby the size of each sub-regions is small enough such that a conventional inspecting method can reliably inspect each of the sub-regions using respective models. Nichani does not appear to disclose combining all location information to produce a distortion vector field. However, He et al. ("He") teaches that it is known to combine all location information to produce a distortion vector field for each sub-region (Figure 10; Col. 12, lines 33-39). He also teaches that it is known to allow for pass/fail decisions based on user-specified tolerances (Col. 7, lines 46-48). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified the location information disclosed by Nichani to include producing a distortion vector field as taught by He because it allows for the correction of spatial distortions (Col. 5, lines 21-23).

6. Claims 5 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nichani et al. (5,673,334) and Ueda et al. (5,271,068) as applied to claims 1 and 14 above, and further in view of Aiyer et al. (5,777,729).

Regarding claims 5 and 20, Nichani discloses training the inspection tool for the respective model for each of the sub-regions (Col. 6, lines 26-30). Nichani and Ueda do not disclose performing the training by using a golden template comparison method. However, Aiyer et al. ("Aiyer") teaches that it is known to train the inspection tool for the respective model for each of the plurality of sub-regions performed by using a golden template comparison

method (Col. 7, lines 64-67 and Col. 8, lines 1-11). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified the training of the inspection tool disclosed by Nichani and Ueda to use the golden template comparison method, as taught by Aiyer, in order to provide more effective training.

7. Claims 7, 9, and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nichani et al. (5,673,334), Ueda et al. (5,271,068), and Companion et al. (6,330,354) as applied to claims 6 and 27 above, and further in view of He et al. (6,088,482).

Regarding claims 7 and 31, the arguments analogous to those presented above for claim 34 are applicable to claims 7 and 31.

Regarding claim 9, the arguments analogous to those presented above for claim 34 are applicable to claim 9. Ueda discloses producing a correlation for each sub-region (Col. 8, lines 16-39). Companion teaches that it is known to produce a difference image for each of the sub-regions (Col. 5, lines 1-7). Companion also teaches that it is known to combine the difference images into a single difference image (Col. 6, lines 10-12). Therefore, it would have been obvious to one of ordinary skill in the art to have modified the inspection as disclosed by Nichani to include producing and combining difference images, as taught by Companion, as well as match images, as taught by Ueda, because it is well known in the art of template matching in order to further inspect each sub-region.

8. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nichani et al. (5,673,334), Ueda et al. (5,271,068), and Companion et al. (6,330,354) as applied to claim 6 above, and further in view of Miyake (6,009,213).

Regarding claims 11, Nichani discloses inspecting each of the sub-regions (Col. 13, lines 53-54). Nichani does not recognize using transformation information from located ones of sub-regions to interpolate transformation information for a sub-region when the sub-region cannot be located. However, Miyake teaches that it is known to use interpolation based on transformed information for a sub-region (Col. 5, lines 62-65), as broadly as claimed. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified the inspection method disclosed by Nichani, Ueda, and Companion to include interpolation based on transformation information, as taught by Miyake, and then use the interpolated transformation information to inspect the sub-region in order to inspect sub-regions that cannot be located.

9. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nichani et al. (5,673,334), Ueda et al. (5,271,068), and Companion et al. (6,330,354) as applied to claim 6 above, and further in view Dance et al. (6,285,799).

Regarding claim 12, Nichani discloses training a search tool and an inspection tool for a respective model for each of sub-regions (Col. 6, lines 26-30). Nichani does not recognize using the respective models for some of the sub-regions to determine respective transformation information. However, Dance et al. ("Dance") teaches that it is known to determine transformation information (Col. 9, lines 63-64). Dance also teaches that it is known to predict registration results by using the respective transformation information (Col. 9, lines 63-65). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified the training method disclosed by Nichani, Ueda, and Companion to include determining transformation information and predicting registration results by using the

transformation information, as taught by Dance, in order to correct blurred images recorded by digital cameras (Col. 3, lines 6-17) and thereby compensate for training that was not successfully performed on a sub-region.

10. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nichani et al. (5,673,334), Ueda et al. (5,271,068), and Companion et al. (6,330,354) as applied to claim 6 above, and further in view Aiyer et al. (5,777,729).

Regarding claim 13, the arguments analogous to those presented above for claim 5 are applicable to claim 13.

11. Claim 33 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nichani et al. (5,673,334), Ueda et al. (5,271,068), and Companion et al. (6,330,354) as applied to claim 6 above, and further in view Clark et al. (6,370,197).

Regarding claim 33, Nichani discloses using a search tool to locate the plurality of sub-regions (Col. 9, lines 17-21). Nichani does not disclose dividing the sub-regions into smaller sub-regions when one of the sub-regions cannot be located. However, Clark et al. ("Clark") teaches that it is known to further sub-divide a block or "sub-region" when a condition is not met after inspection of the sub-region (Abstract, lines 2-7). Therefore, it would have been obvious to one of ordinary skill in the art to have modified the search tool disclosed by Nichani, Ueda, and Companion to include dividing one of the sub-regions into a plurality of smaller sub-regions when the one of the sub-regions cannot be located during the use of the search tree information by applying Clark's teaching to further sub-divide a sub-region when a condition is not met, in order to locate the sub-region that could not be located by the search tree information.

12. Claims 15 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nichani et al. (5,673,334) and Ueda et al. (5,271,068) as applied to claims 14 and 21 above, and further in view of He et al. (6,088,482).

Regarding claims 15 and 22, the arguments analogous to those presented above for claim 7 are applicable to claims 15 and 22.

13. Claims 18, 26, and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nichani et al. (5,673,334) and Ueda et al. (5,271,068) as applied to claims 14, 21, and 27 above, and further in view of Miyake (6,009,213).

Regarding claims 18, 26, and 32, the arguments analogous to those presented above for claim 11 are applicable to claims 18, 26, and 32.

14. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nichani et al. (5,673,334) and Ueda et al. (5,271,068) as applied to claim 14 above, and further in view Dance et al. (6,285,799).

Regarding claim 19, the arguments analogous to those presented above for claim 12 are applicable to claim 19.

Response to Arguments

15. Applicant's arguments filed 9/8/03 have been fully considered but they are not persuasive.

Summary of Applicant's Argument: Nichani does not teach "sub-regions" being "small enough such that a conventional inspecting method can reliably inspect each of the sub-regions."

Nichani does not disclose or suggest using a single search tree. Nichani does not disclose running a coarse alignment tool to approximately locate the pattern within a region of interest.

Examiner's Response: The image includes a region of interest which is divided into a plurality of windows, thereby "sub-regions" (Col. 7, 40-43). Note, Nichani discloses the windows should be big enough to accommodate the uncertain orientation of the package at run time (Col. 7, 43-46). However, a conventional inspecting method is used to reliably inspect each window or "sub-region" (Col. 12, lines 14-17), thereby the size of each sub-regions is small enough such that a conventional inspecting method can reliably inspect each of the sub-regions. Furthermore, the new rejection now includes Ueda which teaches including sub-images dividing the region of interest in its entirety small enough such that a conventional inspecting method can reliable inspect each of the sub-regions.

Nichani discloses constructing a minimum spanning forest constituted by a plurality of trees (Col. 9, lines 53-63). While Nichani does not expressly state building a single search tree, Nichani discloses the number of trees can be manually input (Col. 9, lines 64-67, Col. 10, lines 1-4). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified the number of search trees disclosed by Nichani to include specifying a single search tree because it is well known in the art and would be a matter of design choice depending on the number of local alignment points (Col. 9, lines 64-67, Col. 10, lines 1-4).

Nichani discloses running a coarse alignment tool as claimed (Col. 6, lines 46-67, Col. 7, lines 1-15) . Nichani discloses two coarse alignment features that determine rotation and coarse position (Abstract).

Contact Information

16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Virginia M Kibler whose telephone number is (703) 306-4072. The examiner can normally be reached on Mon-Thurs 8:00 - 5:30 and every other Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amelia Au can be reached on (703) 308-6604. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 306-0377.

VK
12/22/03

MEHRDAD DASTOURI
PRIMARY EXAMINER